SECTION C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. Show that $\log\sqrt{12} = 1+\left(\frac{1}{2}+\frac{1}{3}\right)\frac{1}{4}+\left(\frac{1}{4}+\frac{1}{5}\right)\frac{1}{4^2}$

$+\left(\frac{1}{6}+\frac{1}{7}\right)\frac{1}{4^3}+\cdots$

17. Increase the roots of the equation by 1 and solve the equation $6x^4+29x^3+13x^2-32x-16=0$.

18. Find the eigen values and eigen vectors of the matrix $\begin{bmatrix} 3 & -1 & 3 \\ -1 & 5 & 1 \\ 3 & 1 & 5 \end{bmatrix}$.

19. Solve the following simultaneous equations. by cramer's rule.

$x+2y+5z=23$

$3x+y+4z=26$

$6x+y+7z=47$

20. Expand $\sin^3\theta\cos^5\theta$ in a series of sines of multiples of θ.

APRIL/MAY 2024

23UEEL12 — BASIC MATHEMATICS –1

Time : Three hours Maximum : 75 marks

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SECTION A — (10 × 2 = 20 marks)

Answer ALL the questions.

1. Write the expansion of $(1-x)^n$.

2. Find the nth term of the series $\frac{1}{1.4}+\frac{1}{2.5}+\frac{1}{3.6}+\cdots$

3. Define reciprocal equation.

4. Find the upper limit of the roots for the equation $x^4-2x^3-13x^2+38x-24=0$.

5. Define Unitary matrix.

6. State Cyley Hamilton theorem.

7. Find the adjoint of the matrix. $A=\begin{bmatrix} 2 & 3 \\ 5 & 9 \end{bmatrix}$.

8. Find the values of $3A+5B$ if $A=\begin{bmatrix} 3 & 4 \\ 5 & 6 \end{bmatrix}$ and $B=\begin{bmatrix} 2 & 3 \\ 7 & 2 \end{bmatrix}$.

9. Write the expansion of $\sin n\theta \cos n\theta$.

10. If $x = \cos\theta + i\sin\theta$ then find the value of $x^n + \frac{1}{x^n}$ and $x^n - \frac{1}{x^n}$.

SECTION B — (5 × 5 = 25 marks)

Answer ALL questions.

11. (a) Resolve in to partial Fractions

$$\frac{x^2 - 10x + 13}{(x-1)(x^2 - 5x + 6)}.$$

Or

(b) Sum the series

$$\frac{1^2}{1!} + \frac{1^2 + 2^2}{2!} + \frac{1^2 + 2^2 + 3^2}{3!} + \cdots$$

$$+ \frac{1^2 + 2^2 + \cdots + n^2}{n!} + \cdots$$

12. (a) Solve the equation

$$6x^6 - 25x^5 + 31x^4 - 31x^2 + 25x - 6 = 0.$$

Or

(b) Diminish the roots of the equation.

$x^4 - 5x^3 + 7x^2 - 4x + 5 = 0$ by 2.

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13. (a) Find the characteristics equation of the matrix $A = \begin{bmatrix} 2 & 2 & 0 \\ 2 & 1 & 1 \\ -7 & 2 & -3 \end{bmatrix}$.

Or

(b) Prove that the matrix are orthogonal

$$\begin{bmatrix} \cos\theta & \sin\theta & 0 \\ -\sin\theta & \cos\theta & 1 \\ 0 & 0 & 1 \end{bmatrix}.$$

14. (a) Find the inverse of the matrix

$$A = \begin{bmatrix} 1 & 2 & 1 \\ 2 & 3 & -1 \\ 0 & -1 & 3 \end{bmatrix}.$$

Or

(b) Solve the equation

$6x + 2y - 2z = 6$

$-2x + 2y + 2z = 2.$

$2x + 2y + 2z = 6$

15. (a) Prove that $\frac{\sin 9\theta}{\sin\theta} = 256\cos^8\theta - 448\cos^6\theta$

$+ 240\cos^4\theta - 49\cos^2\theta + 1.$

Or

(b) Expand $\sin^7\theta$ in a series of sines of multiples of θ.